FLOOD REGULATION AND SILT CONTROL ON THE SILVER CREEK FLOODWAY *

A6

FLOODS-FLOOD CONTROL

By R. N. Towl 1/

Silver Creek, like most of the small tributaries of the Missouri River in the vicinity of Tekamah, Neb., carries a heavy burden of silt from its watershed of 27 sq. mi. The Silver Creek floodway has built up bermes about 7 ft. above the outside land level for a distance of more than two miles from the sloping land at the foot of the hills and crossing the level bottom land in the valley. The levees have been raised a number of times by cleanout operations. The central ditch has a depth of 4 to 6 ft. below the berme level. The present berme line has a slope of about 2 ft. per mile.

In the distance of 2 mi. holes and breaks in the levees, caused largely by shrinkage cracks, will number forty or more. At these places in the floods of June and September, 1926, water has escaped onto the adjoining lands. On the south side nearly all of the land was in corn. Part of this area was tiled. The quarter-section where most of the breaks occurred had a general fall of 2 ft. from north to south and 1 ft. from west to east. Corn was listed. The fill thinned out to a depth of about 1/4 in. at a distance of 1/4 mi. from the floodway. All heavy drift passing through the breaks lodged within about 200 ft., where the silt fill amounted to 6 or 8 in. Near the breaks, on the bermes, silt was deposited in many places more than 6 in. in depth.

It is proposed to flood a net area of 200 acres adjoining the floodway where the district has rented about 500 acres of good farm land. This will be ample area for a period of years. The balance of the land will be protected by a levee about 8 ft. in height which will run east and west through the center of the tract and parallel with the floodway.

The three outstanding benefits will be derived from this plan: First, flood regulation will be accomplished for a period of several hours at and near the peak of the flood. This will reduce the stage of water in the main outlet by increasing the time of discharge. It will be necessary to keep the basin empty by the use of a 24-in. pipe near the outlet of the basin, which will operate in connection with a berme spillway. This construction will be inexpensive and subject to modification to meet changing conditions.

Second, silt control in the basin will be accomplished by enlarging the width of the breaks and making a gradual slope from the berme to the outside land. By using the breaks in the present levees there may be an uneven spread of silt over the adjoining land near the floodway. This will be overcome by the construction of a parallel dike 2 ft. in height constructed at a distance of 200 ft. from the floodway by means of a blade grader. The intervening area between the floodway and the dike should be maintained in sweet clover or other rank vegetation, which will retard the flow of water and cause a heavy precipitation of silt, which will ultimately form a wide, elevated and secure base for the floodway.

1/ Towl, Nelson & Schwartz, consulting drainage engineers, Omaha, Neb. Mem. A.S.A.E.

Third, the benefit to the main outlet will be conferred by the removal of silt and return of clarified water which will be valuable in the transportation of sediment from other sources. Also there will be a benefit to the channel by the increased duration of flow and reduction of flood height, which will continue from the junction to the Missouri River.

In the event of an excessive flood overtaking the capacity of the outlet, the Tekemah spillway must operate by conducting the overflow into the main drainage of the valley without damage to the adjoining lands. This has occurred a number of times. In like manner, the control basin for Silver Creek waters should provide against breakage of the south levee. This may be accomplished at slight expense by making an extra heavy section with outside slope ten to one near the outlet at the east end, where the levee is at its lowest elevation.

It is estimated that the enclosing levee may be constructed with 30,000 cu. yd. of embankment. In the future it may be necessary to increase the dimensions of the levee after the basin is partially filled with silt, or on account of necessary maintenance.

The north levee of the floodway will be temporarily relieved of pressure. However, it should be strengthened by taking silt from the flood channel and making the flattest possible slope which it will run to on the land side. This will permit farming or pasture on the major portion of the levee.

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------Agricultural Engineering,
Vol. 8, No. 11, Nov. 1927, p. 304.

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By R. N. Towl 1/

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1/ Towl, Nelson & Schwartz, consulting drainage engineers, Omaha, Neb. Mem. A.S.A.E.

JA

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In the distance of 2 mi., holes and breaks in the levees, caused largely by shrinkage cracks, will number forty or more. At these places in the floods of June and September, 1929, water has escaped onto the adjoining lands. On the south side nearly all of the land was in corn. Part of this area was tiled. The quarter-section where most of the breaks occurred had a general fall of 2 ft. from north to south and 1 ft. from west to east. Corn was listed. The fill thinned out to a depth of about 1/4 in. at a distance of 1/4 mi. from the floodway. All heavy drift passing through the breaks lodged within about 200 ft., where the silt fill amounted to 6 or 8 in. Near the breaks, on the berms, silt was deposited in many places more than 6 in. in depth.

It is proposed to flood a net area of 800 acres adjoining the floodway where the district has rented about 500 acres of good farm land. This will be ample area for a period of years. The balance of the land will be protected by a levee about 8 ft. in height which will run east and west through the center of the tract and parallel with the floodway.

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1/ Towl, Nelson & Schwarts, consulting drainage engineers, Lincoln, Neb.
Mem. A.S.A.E.

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In the event of an excessive flood overtaking the capacity of the outlet, the Tekemah spillway must operate by conducting the overflow into the main drainage of the valley without damage to the adjoining lands. This has occurred a number of times. In like manner, the control basin for Silver Creek waters should provide against breakage of the south levee. This may be accomplished at slight expense by making an extra heavy section with outside slope ten to one near the outlet at the east end, where the levee is at its lowest elevation.

It is estimated that the enclosing levee may be constructed with 30,000 cu. yd. of embankment. In the future it may be necessary to increase the dimensions of the levee after the basin is partially filled with silt, or on account of necessary maintenance.

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JA

FLOOD REGULATION AND SILT CONTROL ON THE SILVER CREEK FLOODWAY *

By R. H. Towl [1]

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In the distance of 2 mi. holes and breaks in the levees, caused largely by burrowing animals, will number forty or more. At these places in the floods of June and September, 1928, water has escaped onto the adjoining lands. On the south side nearly all of the land was in corn. Part of this area was tiled. The quarter-section where most of the breaks occurred had a general fall of 2 ft. from north to south and 1 ft. from west to east. Corn was listed. The fill thinned out to a depth of about 1/4 in. at a distance of 1/4 mi. from the floodway. All heavy drift passing through the breaks lodged within about 200 ft., where the silt fill amounted to 6 or 8 in. Near the breaks, on the berms, silt was deposited in many places more than 6 in. in depth.

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The three substantial benefits will be derived from this plan: First, flood regulation will be accomplished for a period of several hours at and near the peak of the flood. This will reduce the stage of water in the main outlet by increasing the time of discharge. It will be necessary to keep the basin empty by the use of a 24-in. pipe near the outlet of the basin, which will operate in connection with a berm spillway. This construction will be inexpensive and subject to modification to meet changing conditions.

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[1] Towl, Nelson & Schwartz, consulting drainage engineers, Omaha, Neb.
Mem. A.S.A.E.

Colorado
Gila 17

Ab

GILA WATERSHED

From Happ - Conference with Western Reservoir Survey party, in regard to memorandum on proposed problems for research, at Monrovia, Calif., February 19-22, 1936.

Small dam has been built to check sediment on Benita Creek, draining into Gila above San Carlos Reservoir.

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From Hemp - Conference with Western Reservoir Survey party, in regard to memorandum on proposed problems for research, at Monrovia, Calif., February 19-22, 1956.

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It is estimated that the enclosing levee may be constructed with 30,000 cu. yd. of embankment. In the future it may be necessary to increase the dimensions of the levee after the basin is partially filled with silt, or on account of necessary maintenance.

The north levee of the floodway will be temporarily relieved of pressure. However, it should be strengthened by taking silt from the flood channel and making the flattest possible slope which it will run to on the land side. This will permit farming or pasture on the major portion of the levee.

It is desirable to maintain a central channel in the floodway about 4 ft. deep. This will carry the normal flow and conduct the flood waters to the various breaks in the levee and make it possible to maintain a fairly uniform depth of overflow on the berme. It will also carry most of the drift in all ordinary floods, for the reason that there will not be sufficient depth to carry the drift out of the channel as the overflow water crosses the berme spillway.

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In the event of an excessive flood overtaxing the capacity of the outlet, the channel spillway must operate by conducting the overflow into the main drainage of the valley without damage to the adjoining lands. This has occurred a number of times. In like manner, the natural basin for silt-laden water should provide against breakage of the south levee. This may be accomplished at little expense by making an extremely resistant earth embankment slope on the east or one outside of the east end, where the levee is at its lowest elevation.

It is estimated that the auxiliary levee may be constructed with 80,000 cu. yds. of embankment. In the future it may be necessary to increase the dimensions of the levee after the basin is partially filled with silt, or on account of necessary maintenance.

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Agricultural Engineering,
Vol. 8, No. 11, Nov. 1927, p. 321.

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By R. N. Towl[1/]

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1/ Towl, Nelson & Schwartz, consulting drainage engineers, Omaha, Neb. Mem. A.S.A.E.

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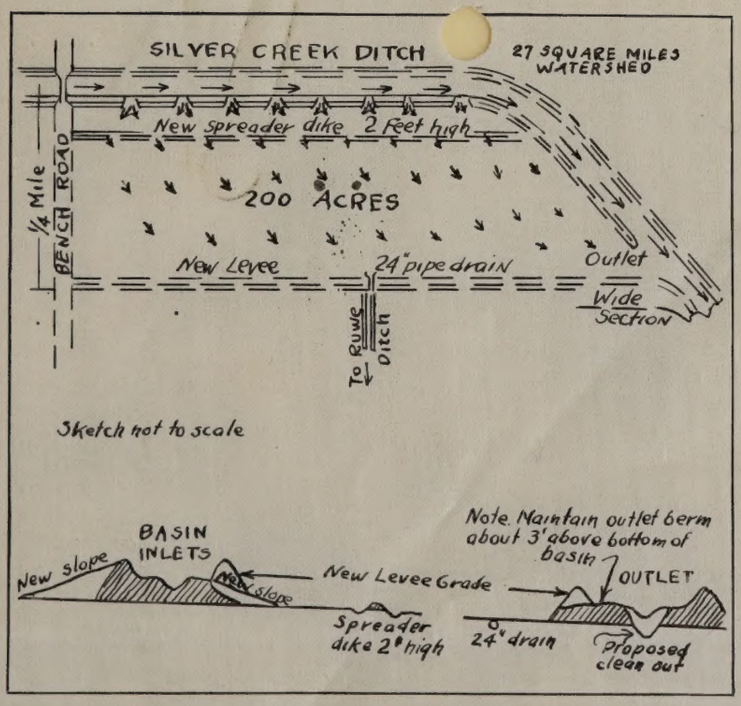
It is estimated that the enclosing levee may be constructed with 30,000 cu. yd. of embankment. In the future it may be necessary to increase the dimensions of the levee after the basin is partially filled with silt, or on account of necessary maintenance.

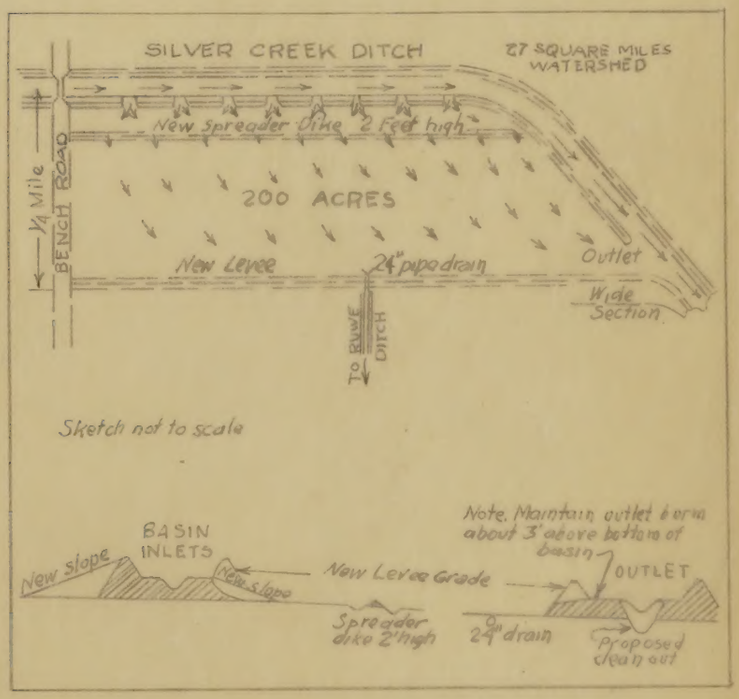
The north levee of the floodway will be temporarily relieved of pressure. However, it should be strengthened by taking silt from the flood channel and making the flattest possible slope which it will run to on the land side. This will permit farming or pasture on the major portion of thelevee.

It is desirable to maintain a central channel in the floodway about 4 ft. deep. This will carry the normal flow and conduct the flood waters to the various breaks in the levee and make it possible to maintain a fairly uniform depth of overflow on the berme. It will also carry most of the drift in all ordinary floods, for the reason that there will not be sufficient depth to carry the drift out of the channel as the overflow water crosses the berme spillway.

------Agricultural Engineering, Vol. 8,
No. 11, Nov. 1927, p. 304.



Plan and cross-sectional views of
Silver Creek floodway at Tekamah, Neb.



In the event of an excessive flood overtaking the capacity of the outlet, the Tekamah spillway must operate by conducting the overflow into the main drainage of the valley without damage to the adjoining lands. This has occurred a number of times. In like manner, the control basin for Silver Creek waters should provide against breakage of the south levee. This may be accomplished at slight expense by making an extra heavy section with outside slope ten to one near the outlet at the east end, where the levee is at its lowest elevation.

It is estimated that the enclosing levee may be constructed with 30,000 cu. yd. of embankment. In the future it may be necessary to increase the dimensions of the levee after the basin is partially filled with silt, or on account of necessary maintenance.

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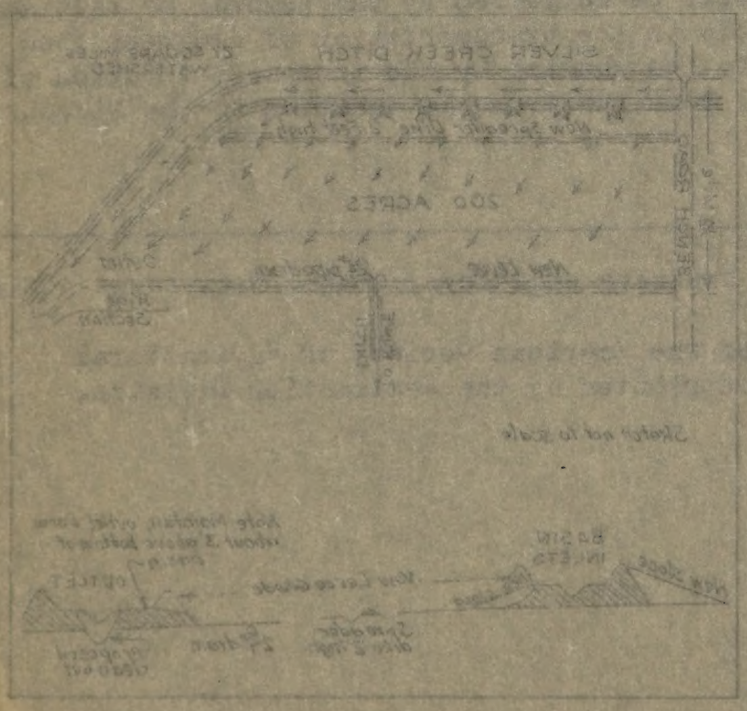

VI--Sample $\frac{1}{4}$ distance from right bank of stream.
VII--Opposite lower bay, middle of stream.
VIII--Just outside of channel opposite lower bay.
IX--In cultivated field near old house, field cultivated in 1936.
X--In cultivated field near present house, field cultivated in 1934.

A6

SILTING BASINS

4/26/36
Dull, cloudy, intermittent rain, cold.

T. 2 S., Rs. 21, 22 E., S. 24, S. 20.
Doniphan County, Kansas
Appx. 8 N.E. Wathena

These silting basins are located just north of the bluff line of the Missouri River on alluvial soils. Their primary purpose is to remove silt from water coming from the uplands in order that the three mile main drainage ditch with a low grade will not become silted very rapidly and in order that silt will not spread unregulated over various farms.

The silting basins are a part of the Doniphan County Drainage District comprising 1900 ac. of land. All information here obtained from C. F. King, Rt. 2, Troy, Kans. Treas. of District.

A ditch out from Chase Cr. to the Missouri R. filled to a large extent in 1917, most of the fill occurring in one flood.

W. B. Hazen, C.E., St. Joseph, Mo. was employed to survey drainage district and make recommendations. He recommended holding sediment behind a diked area to permit low grade ditch to function.

In 1920 an area 26.56 ac. was leveed to a height of 6' and the flow of Chase Cr. diverted into it. In 1930 this initial field had filled to an average depth of 5'9" according to Mr. King. Deposit is more sandy at upper end and is a silty clay loam at lower end.

In 1930 flow diverted to west side of road into and area 35.53 ac. Also belonging to C.F. King. A dike 700 ft. long was built parallel to bluff and 100-300 ft. away from it. Larger part of sediment has accumulated behind levee. In 1936 38.12 ac. belonging to W.A. King added and upper dike extended to middle of this tract. 3' dike on lower side this area.

Drainage district pays for use of this land as a benefit to District. C. F. King was paid $25 per ac. for the 26 ac. from 1920-30. He is being paid $15 per ac. for the 35 ac. on a 99 yr. lease to expire at option of District.

King states he farmed 26 ac. during period of fill and made crop 3 or 4 yrs. Av. year about 65 bu. prod. of corn, but 2 years since has averaged 80 bu. on tract. This tract now has much higher production than adjacent bottom land which averages 30-40 bu/ac.

Drainage dist. bonds issued $30,000. Operating cost $1500 per yr. including rental cost on basins amounting to about $900. Drainage tax about $2 ac. after bonds paid $1.

Dike around new fields about 3' high at present. Material being deposited is very fine silt or silty clay.

Area Chase Cr. watershed 1.68 sq.mi. according to Hazen map.

New silting area 15.39 ac. Fred Hoffman land.

According to W.B. Hazen:
Most of Mo. R. bottoms, have natural grade 1½' per mi. 3' grade needed to carry sediment laden water. Many ditches built on 1' grade.

Clark Co. Mo. silting areas north of Alexandra, Mo. Built 1908. No original grade to river. After silting 3' grade obtained. See R.F. Relf, Falls City, Neb.

A6

SILTING BASINS

T. 2 S., Rs. 21, 22 E., S. 24, 5, 20.
Doniphan County, Kansas
Apx. 8 M.E. Watkins

4/26/36
Dull, cloudy, intermittent rain, cold.

These silting basins are located just north of the bluff line of the Missouri River on alluvial soils. Their primary purpose is to remove silt from water coming from the uplands in order that the three mile main drainage ditch with a low grade will not become silted very rapidly and in order that silt will not spread unregulated over various farms.

The silting basins areas part of the Doniphan County Drainage District comprising 1900 ac. of land. All information here obtained from C. F. King, Rt. 2, Troy, Kans. Trees. of District.

A ditch out from Chase Cr. to the Missouri R. filled to a large extent in 1917, most of the fill occurring in one flood.

W. B. Mason, C.E., St. Joseph, Mo. was employed to survey drainage district and make recommendations. He recommended holding sediment behind a diked area to permit low grade ditch to function.

In 1920 an area 26.56 ac. was leveed to a height of 6' and the flow of Chase Cr. diverted into it. In 1930 this initial field had filled to an average depth of 3'9" according to Mr. King. Deposit is more sandy at upper end and is a silty clay loam at lower end.

In 1930 flow diverted to west side of road into and area 36.53 ac. Also belonging to C.F. King. A dike 700 ft. long was built parallel to bluff and 100-300 ft. away from it. Larger part of sediment has accumulated behind levee. In 1936 36.12 ac. belonging to W.A. King added and upper dike extended to middle of this tract. 3' dike on lower side this area.

Drainage district pays for use of this land as a benefit to District. C. F. King was paid $26 per ac. for the 26 ac. from 1920-30. He is being paid $18 per ac. for the 36 ac. on a 99 yr. lease to expire at option of District.

King states he farmed 26 ac. during period of fill and made crop 3 or 4 yrs. Av. year about 55 bu. prod. of corn, but 2 years since has averaged 80 bu. on tract. This tract now has much higher production than adjacent bottom land which averages 30-40 bu/ac.

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Dike around new fields about 3' high at present. Material being deposited is very fine silt or silty clay.

Area Chase Cr. watershed 1.88 sq.mi. according to Mason map.

New silting area 16.39 ac. Fred Hoffman land.

According to W.B. Mason:
Most of Mo. R. bottoms have natural grade 1½' per mi. 3' grade needed to carry sediment laden water. Many ditches built on 1' grade.
Clark Co. Mo. silting areas north of Alexandria, Mo. Built 1908. No original grade to river. After silting 3' grade obtained. See R.F. Neff, Falls City, Neb.